

of the State. On the morning of the 25th low pressure overlay the southern Rocky Mountain region with one of the low centers in southeastern Colorado, while the crest of the anticyclone north of Montana was fully six-tenths of an inch higher. The warning issued was for a moderate cold wave in extreme eastern Colorado. The front of the high-pressure area moved southeastward and sharp falls in temperature occurred, but it is doubtful whether the warning was justified over a considerable area. A frost warning was issued for southeastern New Mexico on the morning of the 26th; this warning was fully verified, several of the substations in the Roswell fruit district reporting a reading of 32°.—*Fredk. H. Brandenburg.*

San Francisco, Cal., forecast district.—During the first and second decades stormy weather continued with but little cessation in the north Pacific States and occurred with marked frequency in northern California and the Plateau region. There was another stormy period in the coast States, from central California north, near the close of the month. In southern California there were two rainy spells; from the 13th to 15th, and from the 19th to 22d. While there were a large number of rainy days in this district, except in southern California, the precipitation for the month was below normal except near the coast from Eureka to Roseburg and at Tatoosh Island.

Storm warnings were ordered on nine days and small-craft warnings on two. Live-stock warnings were issued

on the 14th and 15th and on the 19th, for the northern Plateau region and northeastern California. These were only partially verified, as the conditions did not develop the severity expected.

The storm of the 13th and 14th gave the highest winds of the month in California, with hail and thunderstorms at many places in the interior, snow on the mountains around San Francisco Bay and extending well down in the foothills of the Coast Range and Sierra Nevada Mountains. On the 13th, lightning struck the residence of Mrs. Manuel Paulo, in the southwestern portion of Stockton, San Joaquin County, tearing a hole nearly 2 feet in diameter through the roof. Mrs. Paulo, her baby, and a neighbor were in the house at the time but none of them was injured. During the same storm, in Los Angeles County, a small church collapsed at Otterbein and the roof was blown from a farmhouse and power lines were badly damaged in that vicinity.

The temperature was above normal in the northern portion of this district and below in the southern. There were no marked cold spells. Heavy frosts occurred on several mornings in California, but they were not severe enough to cause injury.

At the close of the month deciduous fruit was in full bloom in California and no injury had been reported from either frost, rain, or winds.—*G. H. Willson.*

RIVERS AND FLOODS, MARCH, 1919.

By H. W. SMITH, Temporarily in Charge.

[Dated: Weather Bureau, Washington, Apr. 30, 1919.]

The melting of snow and breaking up of the ice in the Connecticut River on the 21st to 23d caused some ice gorges and the river was about bank-full. Heavy rains on the 26th and 27th caused a second rise to moderate flood stages. But little damage was done.

Moderate to heavy rains in the south Atlantic States from the 7th to 9th caused most of the rivers to rise from 1 to 5 feet above flood stages. Losses were confined mostly to bridges and live stock.

The floods that were in progress in the east Gulf States at the end of February had subsided by the end of the first week of March. Rains were generally heavy from the 5th to 9th, causing most of the rivers to pass flood stages. The greatest rise was in the Alabama River, which was 14 feet above the flood stage at Selma, Ala. A second rise occurred in the Tombigbee and Pearl Rivers from the 19th to 21st. Only the very lowest river bottoms below Tuscaloosa, Ala., were overflowed. The West Pearl River was above flood stage during the entire month.

General rains and melting snow on the 15th and 16th caused moderate flood stages in northwestern Ohio and in southern Michigan. Losses were largely confined to roads, buildings, and suspension of business.

General moderate to heavy rains on the 5th and 6th, 8th and 9th, and 14th to 16th over the Ohio River watershed caused most of the streams to rise slightly above flood stages. The Ohio River was in flood from Henderson, Ky., to the mouth of the river and the Tennessee River passed the flood stages at most places below Gunterville, Ala. As but little plowing had been done and no planting, the losses were confined largely to harvested crops and live stock.

The Miami and Stillwater Rivers were slightly above flood stages on the 17th and 18th, causing a suspension of construction work of the Miami conservancy district. But little damage was done, except that due to suspension of work.

Very heavy rains occurred in Chester and Decatur Counties, Tenn. The following account was furnished by Roscoe Nunn, meteorologist, Nashville, Tenn.:

There was an unusually heavy rainfall over the western part of Tennessee on March 16 and the early morning of the 17th (see figure). The largest amounts recorded were 10.80 inches at Perryville, Decatur County, and 10.58 inches at Henderson, Chester County. Nearly all stations located west of a line extending from Robertson to Hardin

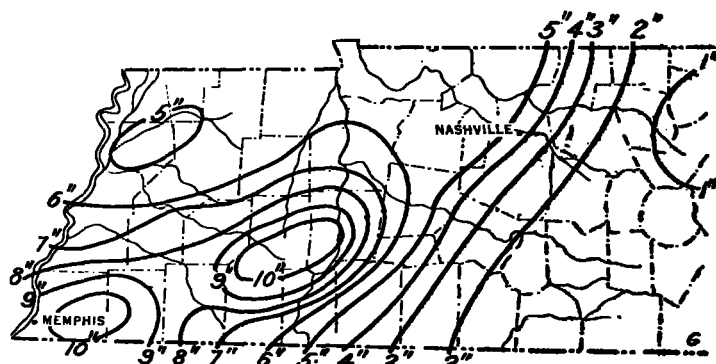


FIG. 1.—Heavy rainfall in West Tennessee on Mar. 16-17, 1919.

Counties received a total of 5 inches or more, while to the east of this line the rainfall was much less. At Memphis 9.72 inches were recorded in 24 hours, exceeding all previous 24-hour records. Of this amount 8.72 inches fell in 12 hours, from 10 a. m. to 10 p. m. of the 16th.

This large amount of water falling within such a short time necessarily resulted in great damage and loss, the money value being probably not less than several hundred thousand dollars. All streams were badly swollen and some of the bottom lands were flooded to an extent not known before. Many bridges were washed away and many others were badly damaged, railroad fills were washed out on several lines, and traffic was seriously interrupted for two or three days. Many persons in low lands were marooned in their homes by the high water, and some were not rescued for two days, being taken from the housetops by boats. Two persons in Madison County were drowned. Much live stock was also lost by drowning, 44 cows being reported by two observers alone. In Memphis there was some complaint of flooding due to inadequate storm sewers, and many cellars were more or less filled with water. There was much additional damage from washing of levees, roadways, and farm lands. Fortunately, very little plowing had been done, and the downpour came on a relatively hard surface; otherwise farm lands would have suffered seriously.

The Illinois River was in flood from the 12th to the end of the month. Much damage was reported, but no estimate of the amount has been received.

High waters in the tributaries caused the Mississippi River to rise slightly above flood stages from Keokuk, Iowa, to Arkansas City, Ark.

The ice broke up in the upper Mississippi and in the Missouri Rivers without forming any serious gorges and no damage was reported.

The western tributaries of the Mississippi reached flood stages at only a few places. Heavy rains on the 16th to 18th caused the Little Arkansas River to rise very rapidly and flood about 1,250 acres of farm land. Several hundred acres of wheat were killed by standing water.

A slight flood occurred in the Trinity River at Dallas, Tex., on the 31st.

The Willamette River at Eugene, Oreg., passed the flood stage on the 3d by 1.5 feet. No damage was done.

Warnings were generally issued well in advance of the flood crests, and much property was saved thereby.

The usual tabular matter and estimated losses by floods and property saved by warnings are shown in the following tables:

Losses by floods, March, 1919.

River district.	Tangible property, bridges, etc.	Crops.	Live stock.	Suspension of business.	Value of warnings.
Charleston, S. C.		\$500	\$100	\$7,500	\$20,000
Columbia, S. C.	\$2,500	700	1,550	960	95,650
Montgomery, Ala.	3,500	280	1,600	1,500	9,000
Mobile, Ala.		35,000	850	6,600	18,000
Meridian, Miss.	750				500
Grand Rapids, Mich.				20,000	
Lansing, Mich.	100	300			1,000
Saginaw, Mich.	8,000	500	1,000	5,000	10,000
Terre Haute, Ind.	5,000	180,000			50,000
Cairo, Ill.		5,000	12,000		1,000
Nashville, Tenn.		350	100		
Wichita, Kans.	3,590				

TABLE I.—Flood stages in the Atlantic drainage for the month of March 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Connecticut:</i>	<i>Feet.</i>			<i>Feet.</i>	
Hartford, Conn.	16	29	(1)	19.8	30
White River Junction, Vt.	13	28	(1)	20.2	29
Bellevue Falls, Vt.	12			11.8	29
Holyoke, Mass.	9	29	29	9.2	29
<i>Unadilla:</i>					
New Berlin, N. Y.	8			7.2	10
<i>Chenango:</i>					
Sherburne, N. Y.	8			7.9	10
<i>Roanoke:</i>					
Randolph, Va.	21			19.2	10
Weldon, N. C.	30	11	12	33.0	1

¹ Continued into April.

TABLE I.—Flood stages in the Atlantic drainage for the month of March, 1919—Continued.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Tar:</i>	<i>Feet.</i>			<i>Feet.</i>	
Tarboro, N. C.	18			17.0	13
Greenville, N. C.	13	12	15	13.5	13, 14
<i>Fishing Creek:</i>					
Enfield, N. C.	14			13.0	5, 10
<i>Neuse:</i>					
Neuse, N. C.	14			13.3	5
Smithfield, N. C.	14			13.7	7
<i>Cape Fear:</i>					
Elizabethtown, N. C.	23	8	12	23.7	11
<i>Pee Dee:</i>					
Cheraw, S. C.	27	10	11	31.2	11
<i>Santee:</i>					
Rimini, S. C.	12	(*)	24	17.8	14
Ferguson, S. C.	12	(*)	30	14.0	15
<i>Catawba:</i>					
Catawba, S. C.	11	10	10	10.8	7
				11.0	10
<i>Waterlee:</i>					
Camden, S. C.	24	7	7	24.4	7
		10	11	29.0	10
<i>Congaree:</i>					
Columbia, S. C.	15	10	11	17.0	11
<i>Broad:</i>					
Blairs, S. C.	15	9	10	18.0	10
<i>Saluda:</i>					
Pelzer, S. C.	7			6.8	10
Chappells, S. C.	14	9	12	16.0	10
<i>Edisto:</i>					
Edisto, S. C.	6			5.6	1
<i>Broad:</i>					
Carlton, Ga.	11	9	9	13.0	9
<i>Oconee:</i>					
Dublin, Ga.	23	(*)	1	23.0	1
<i>Ocmulgee:</i>					
Macon, Ga.	18			17.3	11
Hawkinsville, Ga.	29			28.0	1
				16.4	2, 3
Abbeville, Ga.	11	(*)	9	12.7	17
		12	19	18.8	5
Lumber City, Ga.	15	2	9	13.3	20, 21

² Continued from February.

TABLE II.—Flood stages in the East Gulf drainage for the month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Flint:</i>	<i>Feet.</i>			<i>Feet.</i>	
Albany, Ga.	20	(1)	7	27.8	3
Rainbridge, Ga.	25	(1)	8	29.5	6
<i>Chattahoochee:</i>					
West Point, Ga.	20	10	10	20.5	10
Eufaula, Ala.	40			35.5	11
Alaga, Ala.	30	(1)	2	39.6	12
Do.	30	11	13	32.6	12
<i>Alabama:</i>					
Montgomery, Ala.	35	(1)	3	44.8	12
Do.	35	10	15	47.3	11
Selma, Ala.	35	(1)	5	48.0	1
Do.	35	9	18	49.0	13
<i>Tallahassee:</i>					
Milstead, Ala.	40	9	10	45.4	9
<i>Cowart:</i>					
Gadsden, Ala.	22	11	11	22.0	11
Lock No. 4, Lincoln, Ala.	17	(1)	1	20.0	23
Do.	17	9	14	19.2	9
Wetumpka, Ala.	45	10	11	46.5	11
<i>Etowah:</i>					
Canton, Ga.	11	9	9	13.2	9
<i>Cuhaba:</i>					
Centerville, Ala.	25			23.5	9
<i>Tombigbee:</i>					
Aberdeen, Miss.	33	12	12	33.5	12
Do.	33	19	21	35.6	20
Demopolis, Ala.	39	(1)	(*)	52.8	21
<i>Black Warrior:</i>					
Tuscaloosa, Ala.	46	9	11	51.2	10
<i>Pascagoula:</i>					
Merrill, Miss.	20			19.7	10
<i>Chickasaw:</i>					
Enterprise, Miss.	21			18.1	10
Shubuta, Miss.	27			24.6	10
<i>Pearl:</i>					
Jackson, Miss.	20	6	(*)	27.6	19
Columbia, Miss.	18	(1)	1	18.3	28
Do.	18	19	24	19.1	21
<i>West Pearl:</i>					
Pearl River, La.	13	(1)	(*)	15.4	1

¹ Continued from February.

² February.

³ Continued into April.

TABLE III.—Flood stages in the Great Lakes drainage for the month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Maumee:</i>	<i>Feet.</i>			<i>Feet.</i>	
Fort Wayne, Ind.	15	15	22	21.7	18
Napoleon, Ohio	10	17	20	14.0	18
<i>St. Joseph:</i>					
Montpeller, Ohio	10	16	20	12.8	17
<i>Anglaise:</i>					
Dofiance, Ohio	10	17	19	13.5	18
<i>Saginaw:</i>					
Saginaw, Mich.	19	18	26	23.1	20
<i>Flint:</i>					
Flint, Mich.	14	19	19	14.1	19
Fosters, Mich.	18			17.9	16
<i>Tittabawassee:</i>					
Midland, Mich.	12	17	22	22.0	18
Paines, Mich.	20			19.8	17
<i>Pine:</i>					
Alma, Mich.	7	16	21	12.1	17
<i>Chippewa:</i>					
Mt. Pleasant, Mich.	11	20	20	11.5	20
<i>Cass:</i>					
Vassar, Mich.	14	18	19	15.2	18
<i>Grand:</i>					
Lansing, Mich.	11	17	19	12.0	17
Grand Ledge, Mich.	6	17	17	7.9	17
Ionia, Mich.	21	18	20	23.4	18
Lowell, Mich.	15	18	22	18.3	19
Grand Rapids, Mich.	11	18	24	16.4	20
<i>Red Cedar:</i>					
East Lansing, Mich.	8	17	20	10.1	17
Williamston, Mich.	10	16	19	10.5	17

TABLE IV.—Flood stages in the Mississippi drainage (Ohio Basin) during the month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Ohio:</i>	<i>Feet.</i>			<i>Feet.</i>	
Cloverport, Ky.	10			37.9	19
Henderson, Ky.	33	18	22	35.2	20
Evansville, Ind.	35	18	23	37.5	20
Mount Vernon, Ind.	35	19	23	36.9	21
Shawneetown, Ill.	35	19	29	38.5	22
Paducah, Ky.	43			42.8	22
Cairo, Ill.	45	20	28	48.5	21
<i>Tuscarawas:</i>					
Norris Point, Ohio	8			7.4	10, 18
Coshocton, Ohio	8	18	18	9.5	18
<i>Walhonding:</i>					
Walhonding, Ohio	8	16	18	9.5	17, 18
<i>Scioto:</i>					
La Rue, Ohio	11	17	18	11.7	18
Prospect, Ohio	10	18	18	10.3	18
Circleville, Ohio	7	16	20	12.1	18
Chillicothe, Ohio	14	18	20	16.3	19
<i>Olentangy:</i>					
Delaware, Ohio	9			8.5	17
<i>Miami:</i>					
Tadmor, Ohio	12	17	18	12.6	18
Hamilton, Ohio	12	17	18	13.7	17
<i>Stillwater:</i>					
West Milton, Ohio	10	16	18	12.5	17
<i>Green:</i>					
Lock No. 6, Brownsville, Ky.	30	17	19	34.9	18
Lock No. 4, Woodbury, Ky.	33	17	24	44.1	20
Lock No. 2, Rumsey, Ky.	34	17	30	41.3	24
<i>Wabash:</i>					
Bluffton, Ind.	12	16	19	14.0	17
Lafayette, Ind.	11	15	23	23.1	18, 19
Terre Haute, Ind.	10	17	26	22.4	20
Vincennes, Ind.	14	18	30	20.4	24, 25
Mount Carmel, Ill.	15	17	(1)	24.0	25
<i>White:</i>					
Decker, Ind.	18	19	28	24.4	23
Shoals, Ind.	20	20	24	26.2	23
Anderson, Ind.	12	17	18	14.7	17
Noblesville, Ind.	14	17	18	16.6	17
Indianapolis, Ind.	18			17.2	17
Elliston, Ind.	19	16	23	28.4	19, 20
<i>Cumberland:</i>					
Lock A (Fox Bluff), Tenn.	43			40.8	18
Clarksville, Tenn.	46	17	19	50.4	18
Lock D (Dover), Tenn.	49	18	20	51.4	19
<i>French Broad:</i>					
Penrose, N. C.	13	9	9	13.2	9
Asheville, N. C.	4	9	9	4.0	9
<i>Tennessee:</i>					
Guntersville, Ala.	31			28.8	10
Florence, Ala.	18	9	11	19.5	9
Riverton, Ala.	32	8	14	39.6	10
Do	32	18	19	34.7	18
Savannah, Tenn.	40			36.3	19
Johnsonville, Tenn.	31			30.7	12
Do	31	17	21	35.3	19

1 Continued into April.

TABLE V.—Flood stages in Mississippi drainage during month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Mississippi:</i>	<i>Feet.</i>			<i>Feet.</i>	
St. Paul, Minn.	14			12.5	25-26
Keokuk, Iowa	14	19	25	14.8	20
Warsaw, Ill.	17	19	21	17.8	20
Quincy, Ill.	14	19	27	16.0	21
Hannibal, Mo.	13	18	(1)	16.3	21
Louisiana, Mo.	12	19	29	14.2	22
Grafton, Ill.	18	24	29	18.5	25-27
Alton, Ill.	21	24	25	21.1	25
Cape Girardeau, Mo.	30			28.1	25
New Madrid, Mo.	34	21	(1)	39.1	25
Memphis, Tenn.	35	25	(1)	37.4	29
Helena, Ark.	42	25	(1)	46.0	30-31
Arkansas City, Ark.	42	24	(1)	47.9	31
Greenville, Miss.	42			39.8	31
Vicksburg, Miss.	45			42.9	31
<i>St. Croix:</i>					
Stillwater, Minn.	11	25	(1)	13.5	31
<i>Des Moines:</i>					
Ottumwa, Iowa	10	16	20	13.2	18
<i>Illinois:</i>					
Morris, Ill.	13	16	24	20.3	18
Peru, Ill.	14	13	(1)	23.1	18
Henry, Ill.	7	4	(1)	16.7	39
Peoria, Ill.	16	17	(1)	23.2	22
Havana, Ill.	14	18	(1)	18.6	27-22
Beardstown, Ill.	12	16	(1)	19.5	29-30
Pearl, Ill.	12	21	(1)	16.6	29-30
<i>Missouri:</i>					
St. Charles, Mo.	25			23.2	20
<i>Grand:</i>					
Chillicothe, Mo.	18	17	23	20.0	19
Brunswick, Mo.	10	18	24	12.8	21-22
<i>Meramec:</i>					
Pacific, Mo.	11			10.3	19
<i>Bourbeuse:</i>					
Union, Mo.	10	19	19	10.6	19
<i>St. Francis:</i>					
Marked Tree, Ark.	17	30	(1)	17.0	30-31
<i>Yazoo:</i>					
Greenwood, Miss.	36			34.4	31
Yazoo City, Miss.	25			22.5	31
<i>Tallahatchie:</i>					
Swan Lake, Miss.	25	21	29	29.8	26-27
<i>Ouachita:</i>					
Camden, Ark.	30	20	23	32.0	21
<i>Atchafalaya:</i>					
Melville, La.	37			34.0	31
<i>James:</i>					
Huron, S. Dak.	9	15	(1)	13.4	25-26
<i>Missouri:</i>					
Kansas City, Mo.	22			20.8	18
<i>Kansas:</i>					
Wamego, Kans.	16	16	16	17.8	16
Topeka, Kans.	21			20.0	17
<i>Smoky Hill:</i>					
Lindsborg, Kans.	19			17.8	15
<i>Neosho:</i>					
Neosho Rapids, Kans.	22	17	18	25.0	18
Le Roy, Kans.	24			23.4	20
Iola, Kans.	10			9.6	21
Oswego, Kans.	17			15.3	23
<i>Cottonwood:</i>					
Emporia, Kans.	19	17	19	21.2	18
<i>Little Arkansas:</i>					
Sedgwick, Kans.	18	16	18	23.6	16
<i>Pettit Jean:</i>					
Danville, Ark.	20			17.8	18
<i>White:</i>					
Georgetown, Ark.	22			20.3	26-27
<i>Black:</i>					
Black Rock, Ark.	14	17	21	16.2	18
<i>Cache:</i>					
Jelks, Ark.	9	17	(1)	10.0	28-30

1 Continued into April.

TABLE VI.—Flood stages in the West Gulf drainage during the month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Trinity:</i>	<i>Feet.</i>			<i>Feet.</i>	
Dallas, Tex.	25	31	(1)	29.9	31
<i>Sabine:</i>					
Bon Wier, Tex.	20			19.7	30
<i>Gila:</i>					
Kelvin, Ariz.	5			4.2	24-25

1 Continued into April.

TABLE VII.—Flood stages in the Pacific drainage during the month of March, 1919.

River and station.	Flood stage.	Above flood stages—dates.		Crest.	
		From—	To—	Stage.	Date.
<i>Eel:</i>	<i>Feet.</i>			<i>Feet.</i>	
Fernbridge, Calif.	15			14.3	3
<i>Willamette:</i>					
Eugene, Oreg.	10	3	3	11.5	3
Oregon City, Oreg.	12			11.4	4-5